EL DEVICE WITH ELECTRODE LAYER FOR NOISE REDUCTION AND FABRICATION METHOD THEREOF

BACK GROUD OF THE INVENTION

Field of the invention

The present invention relates to an EL (electroluminescent) device used as parts such as backlight of cellular phone, more particularly, to an EL device capable of reducing audio noise and electrical noise by alternating current power and a fabrication method of the EL device.

Description of Related Art

An inorganic EL (electroluminescent) device driven by alternating current power is possessed of electrical noise by characteristics of the alternating current power that is a driving power source. Particularly, a power source used in mobile phone is a direct current power, wherein transforming direct current power into a power source of sine wave similar to alternating current through an inverter and providing the transformed power source of sine wave to the EL device generally use the mobile phone. The transformed power source of sine wave used in the mobile phone generates electrical noise and audio noise as polarity of dielectric layer is being changed by alternating current power a phase of which is changed.

FIG. 1 illustrates cross sectional structure of a conventional EL device used in parts such as backlight of mobile phone.

Referring to FIG. 1, a conventional EL device comprises a transparent

electrode layer 11 that is formed of ITO and formed on a transparent insulation substrate 10 such as PET (polyethylene terephthalate) film as first electrode, a luminescent layer 12 and an insulation layer 13 as a dielectric layer sequentially formed on the transparent electrode layer 11, a rear electrode layer 14 as second electrode formed on the insulation layer 13, and a protection layer 15 formed to envelope the luminescent layer 12, the insulation layer 13 and the rear electrode layer 14.

The conventional EL device further comprises a ground electrode 16 that is formed on the protection layer 15, and a dielectric rear tape 17 that is formed on the ground electrode 16, wherein the ground electrode 16 is formed of a copper plate, and the dielectric rear tape 17 is adhered onto the ground electrode 16 to insulate the ground electrode 16 from the outside.

In a conventional EL device, the transparent electrode layer 11 and rear electrode layer 14 are used as two electrodes of front electrode and rear electrode respectively to be connected to an output terminal of an inverter (not illustrated in drawing), wherein alternating current power 18 is supplied to the two electrodes 11 and 14. Furthermore, the ground electrode 16 is grounded to a substrate. Therefore, the conventional EL device comprises three terminals of two electrodes 11,14 that are connected to the output terminal of the inverter and the ground electrode 16 that is connected to a ground terminal.

The EL device transforms direct current power of battery through the inverter and provides transformed alternating current power 18 of sine wave to the electrodes 11 and 14, since the direct current power of battery is used as a power source of the EL device.

Therefore, light is emitted from the luminescent layer 12, if the alternating current power 18 of sine wave that is transformed through the inverter is applied to the transparent electrode layer 11 and the rear electrode layer 14 that are acted as two electrodes in an EL device having the foregoing structure.

However, there have been problems in the conventional EL device that electrical noise is generated by the alternating current power of sine wave, and audio noise is generated from the dielectric layer as phase of an alternating current power is alternately being changed.

Furthermore, there have been problems in a conventional EL device that although a copper plate as the ground electrode 16 is formed on the protection layer to reduce noise, the copper plate has to be adhered to the EL device through a separate process, and a ground electrode has to be formed additionally so that the additionally formed ground electrode is grounded to the substrate.

Furthermore, there have been problems in that since an insulation tape surely has to be adhered to the copper plate so that the insulation tape encircles the copper plate so as to insulate the copper plate from the outside, not only process is cumbersome and complex, but also it is difficult to apply the insulation tape to a device to which the insulation tape is not required to be adhered, or to which the insulation tape is partially adhered although it is possible to apply the insulation tape to a backlight of LCD (liquid crystal display) to all over the front of which the insulation tape is required to be adhered.

SUMMARY OF THE INVENTION

The present invention is suggested to solve the foregoing problems of the prior art, and it is an object of the present invention to provide an EL device with electrode capable of reducing audio noise and electrical noise generated by alternating current power and a fabrication method of the EL device.

It is another object of the present invention to provide an EL device capable of simplifying processes by forming an electrode for noise removal during the fabrication process of the EL device, thereby excluding separate copper plate adhering process, ground electrode forming process and insulation tape adhering process, and a fabrication method of the EL device.

It is another object of the present invention to provide an EL device in which an electrode for noise removal is integrally fabricated to be applied to various flat panel devices, and a fabrication method of the EL device

It is the other object of the present invention to provide an EL device capable of removing noise by forming two terminals only with the EL device itself without separate copper plate and ground electrode for noise removal, and a fabrication method of the EL device.

In order to achieve the foregoing objects, the present invention provides an EL device comprising, a transparent electrode layer, a luminescent layer, an insulation layer, a rear electrode layer and a protection layer sequentially formed on an insulation substrate, wherein the protection layer comprises a first and a second protection layers, and an electrode layer for noise reduction is formed between the first and the second protection layers.

Furthermore, the present invention provides a fabrication method of an EL device comprises the steps of forming a transparent electrode layer on an insulation substrate; forming a luminescent layer on the transparent electrode layer; forming an insulation layer on the luminescent layer; forming a rear electrode layer on the insulation layer; forming a first protection layer for covering the luminescent layer, the insulation layer and the rear electrode layer; forming an electrode layer for noise reduction on the first protection layer; and forming a second protection layer for covering the electrode layer for noise reduction.

The electrode layer for noise reduction is formed on the first protection layer by printing a conductive electrode material, e.g. Ag, and is commonly grounded along with the transparent electrode layer so as to be connected to one electrode in the two electrodes of the EL device. Furthermore, the first and second protection layers function as a protection film for preventing penetration of moisture from the outside and an insulation film for insulating between electrodes, wherein the first and second protection layers are formed by printing method using a material such as polyester.

BRIEF DESCRIPTION OF THE DRAWINGS

Further objects and advantages of the invention can be more fully understood from the following detailed description taken in conjunction with the accompanying drawing in which:

FIG.1 is a cross sectional view of a conventional EL device on which a ground electrode is formed; and

FIG. 2 is a cross sectional view of an EL device according to preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The present invention will now be described in detail in connection with preferred embodiment with reference to the accompanying drawings. For reference, like reference characters designate corresponding parts throughout several views.

FIG. 2 illustrates cross sectional structure of an EL device used as backlight of cellular phone according to preferred embodiment of the present invention.

Referring to FIG. 2, an EL device of the present invention comprises a transparent electrode layer 21 that is formed of ITO and formed on a transparent insulation substrate 20 such as PET (polyethylene terephthalate) film as first electrode, a luminescent layer 22 as a phosphor layer that is formed on the transparent electrode layer 21, an insulation layer 23 as a dielectric layer that is formed on the luminescent layer 22, and a rear electrode layer 24 as second electrode that is formed on the insulation layer 23.

Furthermore, an EL device of the present invention further comprises first protection layer 25 that is formed to envelope the luminescent layer 22, the insulation layer 23 and the rear electrode layer 24, an electrode layer 26 for noise reduction that is formed on the first protection layer 25, and second protection layer 27 that is formed to envelope the electrode layer 26 for noise reduction.

The electrode layer 26 for noise reduction is commonly grounded along with the transparent electrode layer 21 that is first electrode, and is connected to one out of output terminals of an inverter (not shown in the drawings) so that the substrate is grounded.

Conductive electrode materials can be used as the electrode layer 26 for noise reduction, and the electrode layer 26 for noise reduction is formed on the first protection layer 25 by printing a metallic electrode material such as Ag in preferred embodiment of the present invention.

The first protection layer 25 and the second protection layer 27 not only prevent penetration of moisture from the outside, but also function as an insulation layer between electrodes. The first protection layer 25 and the second protection layer 27 are formed by printing a material having superior moisture resistant, pressure resistant and insulating characteristics, e.g. polyester.

In an EL device of the present invention, light is emitted from the luminescent layer 22 since direct current power of a battery is transformed through an inverter (not shown in the drawings) so that an alternating current power 28 of sine wave is provided to the transparent electrode layer 21 and the rear electrode layer 24 that are used as two electrodes.

An EL device of the present invention not only reduces electrical noise generated from the transparent electrode layer 21 and the rear electrode layer 24 by the alternating current power, but also reduces audio noise generated from the dielectric layer by the alternating current power by forming the electrode layer 26 for noise reduction on the first protection layer 25, commonly grounding the electrode layer 26 along with the transparent electrode layer 21

and connecting the electrode layer 26 to one electrode in output electrodes of the inverter, thereby grounding the substrate.

The foregoing EL device according to preferred embodiment of the present invention has merits in that electrical noise and audio noise due to alternating current are reduced by forming an electrode layer for noise reduction between protection layers, commonly grounding the electrode layer together with a transparent electrode layer, thereby forming two terminal electrodes differently from the prior art.

The present invention simplifies processes by excluding conventional cumbersomeness that separate copper plate is adhered to the EL device and a ground electrode is formed to have to be grounded with the substrate or adhering an insulation tape to the copper plate, since an electrode for noise removal is formed during the process of fabricating an EL device, and insulation is performed by a protection film. Therefore, an EL device of the present invention has merits in that noise is removed by the EL device itself, and the EL device can be applied to various flat display devices.

While the invention has been particularly shown and described with reference to preferred embodiments thereof, it will be understood by those skilled in the art that the foregoing and other changes in form and details may be made therein without departing from the spirit and scope of the invention.